New Brunswick (NB) River Ice Observation Application and Database - Department of Environment and Local Government (DELG)

Virtual US-Canada Border Conference

September 26, 2013

Brent Newton

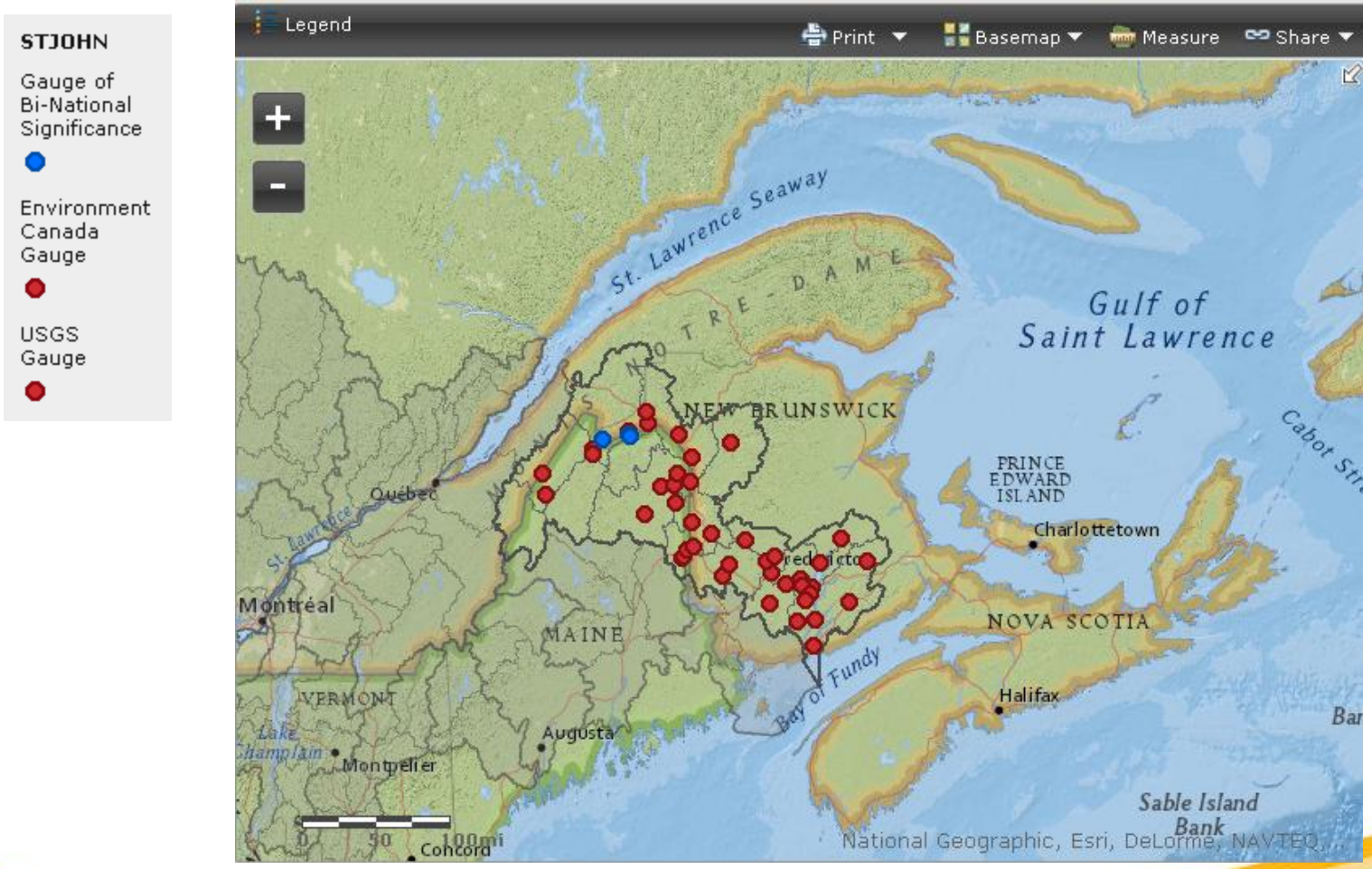
Outline

- Who/Where are we?
- NB River Watch Program
- Models/Software
- Products and Reporting
- River Ice Application and Database
- Questions

DELG – New Brunswick, Canada

http://www.ijc.org/en_/St._John_River_Basin

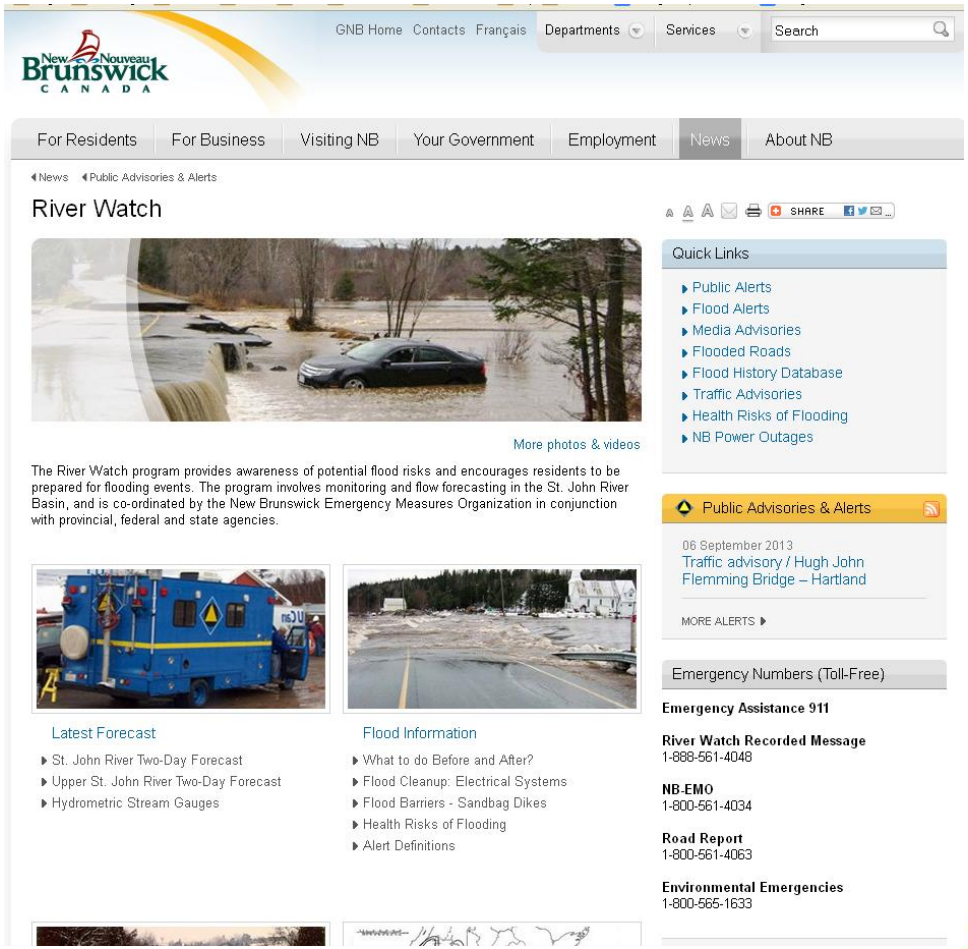
DELG – New Brunswick, Canada



http://www.ijc.org/en_/St._John_River_Basin

NB River Watch Program

- Provides awareness of possible flood risks and encourages residents to be prepared for flooding events (hurricanes)
- Latest water level/flow forecasts
- Most recent snow map analysis
- Links to hydrometric gauges
- Flood Information



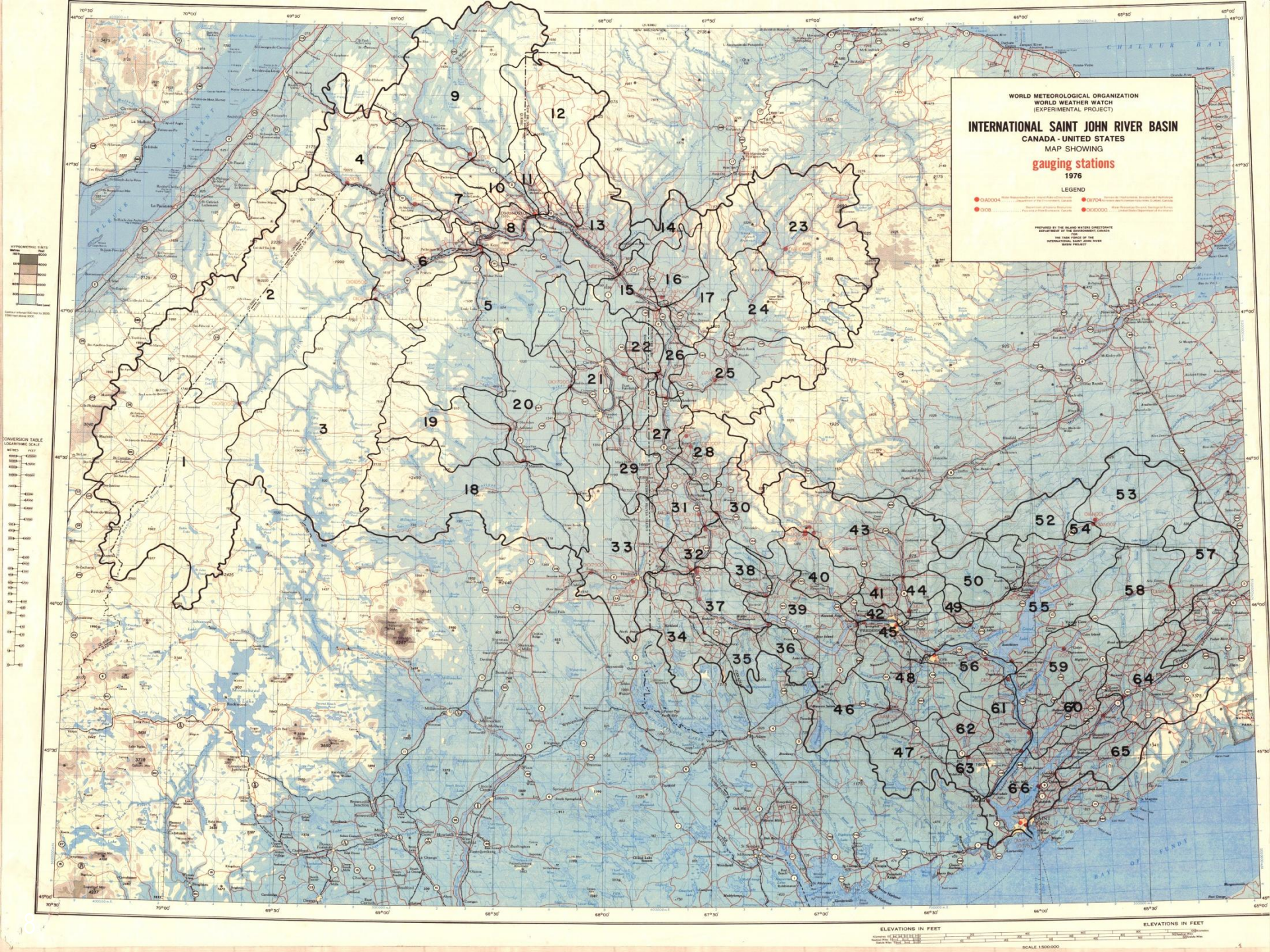
http://www2.gnb.ca/content/gnb/en/news/public_alerts/river_watch.html

River Watch Partnership

- DELG
- DPS-EMO (Dept. of Public Safety – Emergency Measures Organization)
- Environment Canada (Water Survey of Canada & Meteorological Survey of Canada)
- NB Power
- Province of Quebec
- ***USGS***
- ***NOAA National Weather Service***
- ***Algonquin Power Corporation***
- ***Town of Fort Fairfield / MEMA***

Models/Software

- Hydrologic Model – SSARR (Stream Flow Synthesis and Reservoir Regulation)
- Raven
- Hydraulic Model – HEC-RAS (Hydrologic Engineering Center – River Analysis System)
- FEWS – Flood Early Warning System (Deltares)
- WISKI – Data acquisition system (Kisters)


WORLD METEOROLOGICAL ORGANIZATION
WORLD WEATHER WATCH
(EXPERIMENTAL PROJECT)
INTERNATIONAL SAINT JOHN RIVER BASIN
CANADA - UNITED STATES
MAP SHOWING
gauging stations
1976
LEGEND
PREPARED BY THE INLAND WATERS DIRECTORATE
DEPARTMENT OF THE ENVIRONMENT, CANADA
FOR
THE TASK FORCE OF THE
INTERNATIONAL SAINT JOHN RIVER
BASIN PROJECT
HYPSOMETRIC TINTS
CONVERSION TABLE
LOGARITHMIC SCALE
ELEVATIONS IN FEET
ELEVATIONS IN FEET
SCALE 1:500,000

Products and Reporting to River Watch website

- Flow Forecasts
  - 5 Day and 3 Day (internal)
  - 2 Day (public)
- Water Level Forecasts
  - 3 Day Upper SJR (internal)
  - 2 Day Upper SJR (public)
  - 5 Day Lower SJR (internal)
  - 2 Day Lower SJR (public)

Department of Environment

New Nouveau Brunswick

ministère de l'Environnement

SAINT JOHN RIVER 5-DAY FORECAST

Prepared By

HYDROLOGY CENTRE

FOR INTERNAL USE ONLY-NOT FOR PUBLICATION

22-Mar-12

LOCATION		FLOOD STAGE	Flows are in cubic feet per second and water levels in metres						PEAK		
			ACTUAL	RIVER FORECAST							
			700 hrs	0700 hrs	0700 hrs	0700 hrs	0700 hrs	0700 hrs			
			22-MAR	23-MAR	24-MAR	25-MAR	26-MAR	27-MAR			
			THURSDAY	FRIDAY	SATURDAY	SUNDAY	MONDAY	TUESDAY	Time	Date	W/L or FLOW
CLAIR / FORT KENT	FLOW		55,600	112,000	115,000	87,000	60,300	44,300			
GRAND FALLS	FLOW		40,700	106,000	144,000	124,000	92,100	69,600			
AROOSTOCK	FLOW		20,000	38,200	40,800	26,800	17,000	14,200			
TOBIQUE	FLOW		8,550	16,900	15,100	8,400	5,240	4,950			
BEECHWOOD INFLOW	FLOW		74,300	162,000	206,000	167,000	122,000	93,600			
MACTAQUAC INFLOW	FLOW		106,000	207,000	233,000	181,000	131,000	104,000			
MCKINLEY	FLOW		62,989	210,000	230,000	175,000	130,000	105,000			
NASHWAAK (Durham Bridge)	W/L	21.0	21.70	22.5	21.8	20.9	20.7	20.8			
KENNEBECASIS (Apohaqui)	W/L	13.0	9.33	9.0	8.7	8.5	8.4	8.4			
FREDERICTON	W/L	6.5	3.55	6.1	6.9	6.2	5.4	5.0			
MAUGERVILLE	W/L	6.0	3.05	5.3	5.8	5.5	4.8	4.5			
JEMSEG	W/L	4.3	N/A	3.0	3.5	3.6	3.8	3.8			
GRAND LAKE	W/L	5.0	2.19	3.0	3.6	3.8	4.1	4.1			
SHEFFIELD-LAKEVILLE CORNER	W/L	4.8	2.25	2.9	3.5	3.7	3.9	4.0			
OAK POINT	W/L	4.7	1.71	2.2	2.7	2.8	2.9	3.0			
QUISPAMSIS-SAINT JOHN	W/L	4.2	1.83	2.2	2.6	2.8	2.9	3.0			

NOTE: This Forecast is dependent on the development of forecast weather conditions.

The Actual water levels and flows are obtained from stations operated by Environment Canada, NB Power and U.S. Geological Survey.

ISSUED @: 1120

SERIAL NO: 7

STAGE @: 12h50

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UPPER SAINT JOHN RIVER 3-DAY FORECAST

WATER LEVELS (W/L) IN METERS ABOVE MEAN SEA LEVEL 22-Mar-12

The actual water levels are obtained from stations operated by Environment Canada, NB Power and US Geological Survey

** Water level based on computer model. Ice jams can cause actual water levels to vary significantly from forecast levels

Weather input are provided by Environment Canada, US National Weather Service, Quebec Environment

LOCATION		2008 W/L	FLOOD LEVEL	ACTUAL 0700 hrs 22MAR THURSDAY	RIVER FORECAST 0700 hrs 23MAR FRIDAY	0700 hrs 24MAR SATURDAY	0700 hrs 25MAR SUNDAY
CONNOR	** W/L	164.7	170.7	162.0	163.0	163.2	162.7
SAINT FRANCOIS	** W/L	160.7	160.2	156.6	158.1	158.5	157.8
CLAIR \ FORT KENT	W/L	158.18	156.2	154.58	156.3	156.8	156.1
BAKER BROOK	** W/L	151.4	150.8	147.7	148.9	149.3	148.8
SAINT HILAIRE	** W/L	148.1	145.5	143.2	144.8	145.3	144.8
EDMUNDSTON	W/L	143.10	140.5	137.20	139.0	139.8	139.3
IROQUOIS	** W/L	142.0	140.65	135.6	137.5	138.3	137.9
ST. BASILE	** W/L	141.3	143.9	134.4	136.6	137.6	137.1
SAINT ANNE	** W/L	138.8	138.3	131.8	133.9	135.0	134.6
ST. LEONARD	** W/L	137.3	136.0	131.55	133.2	134.1	133.8
WEATHER (MODEL INPUT)	PRECIP.(mm)			0-3	1-2	0	0
	TEMP. (C)			24/5	22/3	5/-6	4/-7

HISTORIC WATER LEVELS (m):-

YEAR	CLAIR	EDMUNDSTON
2008	158.18	143.10
2005	156.27	140.10
1991	------	143.19
1979	157.31	141.41
1973	156.84	------

ISSUED @: 1210
SERIAL NO: 7

NOTE: This Forecast is dependent on the development of forecast weather conditions.

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SAINT JOHN RIVER 3-DAY FORECAST

FLOWS IN CUBIC FEET PER SECOND AND WATER LEVELS (W/L) IN METERS 22-Mar-12

The actual water levels and flows are obtained from stations operated by Environment Canada, NB Power and US Geological Survey

Weather input are provided by Environment Canada, US National Weather Service, Quebec Environment

LOCATION		FLOOD LEVEL	ACTUAL 700 hrs 22-MAR THURSDAY	RIVER FORECAST 0700 hrs 23-MAR FRIDAY	0700 hrs 24-MAR SATURDAY	0700 hrs 25-MAR SUNDAY
CLAIR / FORT KENT	FLOW		55,600	112,000	115,000	87,000
GRAND FALLS DISCHARGE	FLOW		40,700	106,000	144,000	124,000
AROOSTOCK	FLOW		20,000	38,200	40,800	26,800
TOBIQUE	FLOW		8,550	16,900	15,100	8,400
BEECHWOOD INFLOW	FLOW		74,300	162,000	206,000	167,000
MACTAQUAC INFLOW	FLOW		106,000	207,000	233,000	181,000
MCKINLEY	FLOW		62,989	210,000	230,000	175,000
ST. LEONARD	W/L	136.0	131.55			
PERTH ANDOVER	W/L	77.2	75.00			
SIMONDS	W/L	48.5	47.57			
HARTLAND	W/L	45.7	47.20			
WOODSTOCK	W/L	41.4	40.49			
NASHWAAK (Durham Bridge)	W/L	21.0	21.70	22.5	21.8	20.9
KENNEBECASIS (Apohaqui)	W/L	13.0	9.33	9.0	8.7	8.5
FREDERICTON	W/L	6.5	3.55	6.1	6.9	6.2
MAUGERVILLE	W/L	6.0	3.05	5.3	5.8	5.5
JEMSEG	W/L	4.3	N/A	3.0	3.5	3.6
GRAND LAKE	W/L	5.0	2.19	3.0	3.6	3.8
SHEFFIELD-LAKEVILLE CORNER	W/L	4.8	2.25	2.9	3.5	3.7
OAK POINT	W/L	4.7	1.71	2.2	2.7	2.8
QUISPAMSIS-SAINT JOHN	W/L	4.2	1.83	2.2	2.6	2.8
WEATHER (MODEL INPUT)	PRECIP.(mm)NORTH		0-3	1-2	0	0
	PRECIP.(mm)SOUTH		0	1-2	0	0
	TEMP. (C) NORTH		24/5	22/3	5/-6	4/-7
	TEMP. (C) SOUTH		26/7	24/5	8/-5	4/-5

HISTORIC WATER LEVELS (m):-

YEAR	PERTH ANDOVER	SIMONDS	HARTLAND	WOODSTOCK	FREDERICTON	MAUGERVILLE	JEMSEG
2008	78.29	49.64	47.91	41.83	8.36	6.92	6.11
2005	---	50.12	46.97	---	7.83	6.49	5.69
1994	77.25	48.95	48.58	42.44	7.87	6.43	5.17
1993	78.70	47.86	45.82	43.14	6.60	5.58	4.52
1987	79.30	49.26	47.72	44.02	---	---	---
1986	---	51.16	48.01	40.62	---	---	---
1976	78.20	---	47.68	43.08	---	---	---
1973	---	---	---	---	8.61	7.11	6.36

SERIAL NO: 7 ISSUED @: 12h50 BY HYDROLOGY CENTRE

NOTE: This Forecast is dependent on the development of forecast weather conditions.

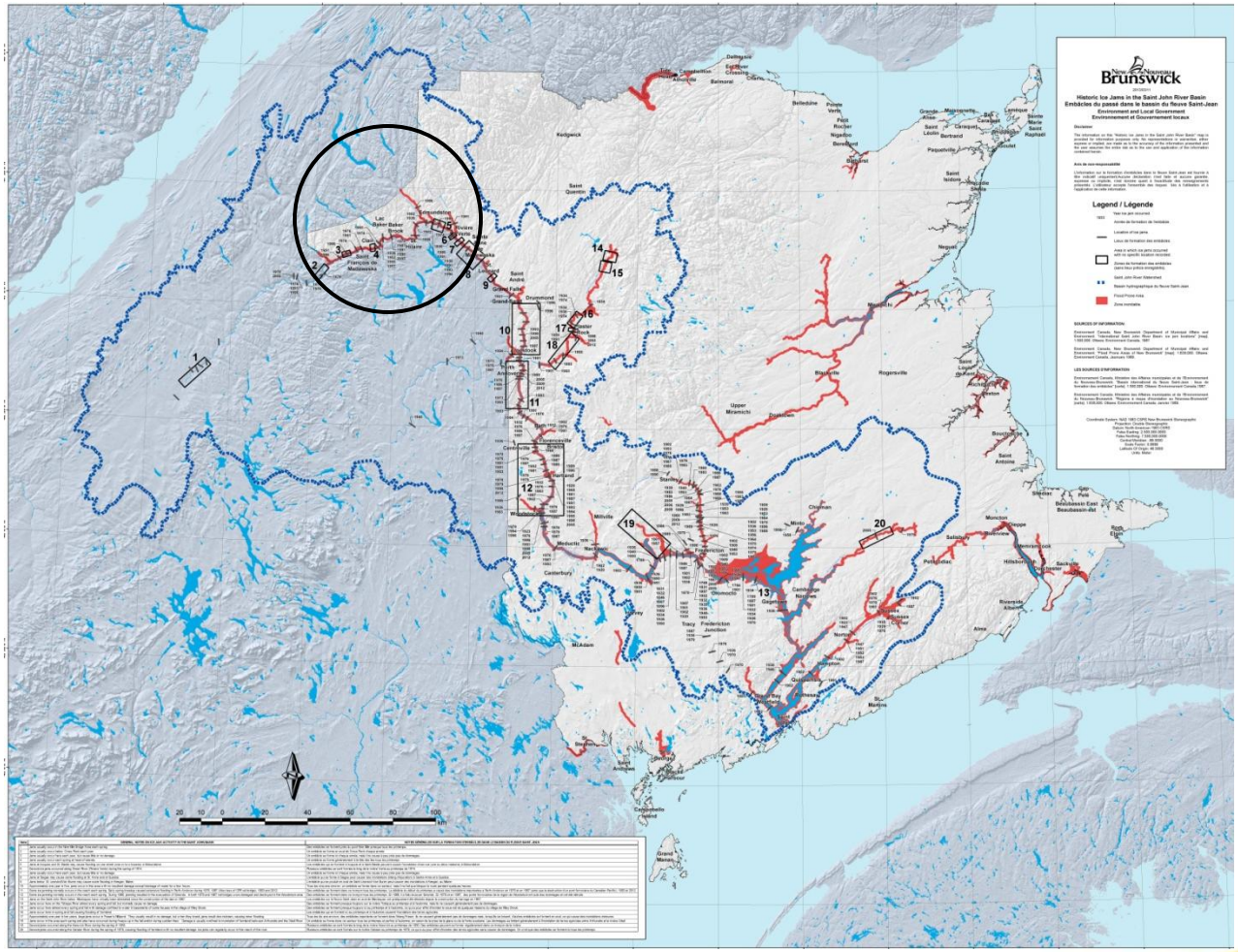
River Watch Operations

- Year-round monitoring and forecasting of river flows in the Saint John River
- Spring season operations (e.g. March 14th until ~ mid-May during spring freshet period)

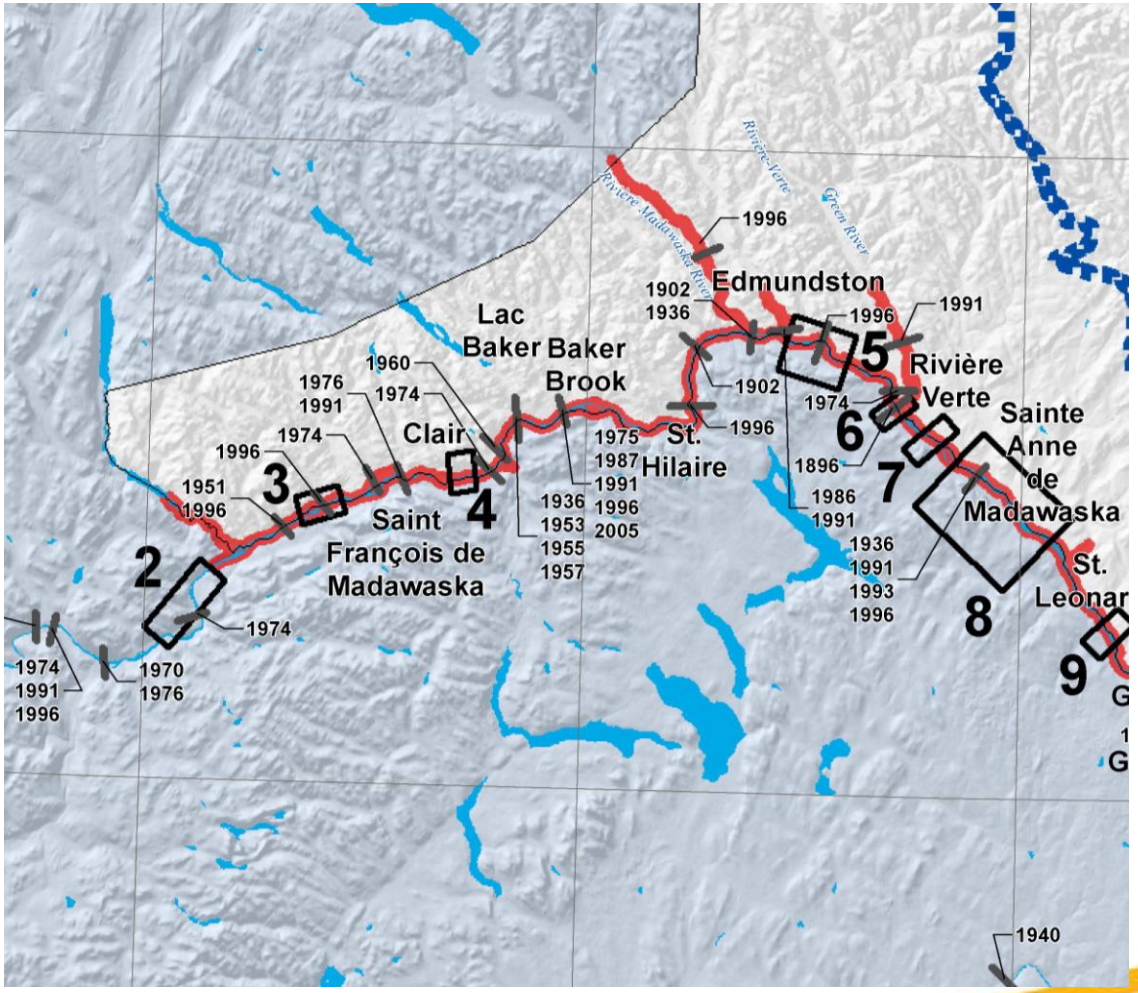
Also for DELG's Hydrology Center

- Monitoring of ice conditions
- Ice cover typically from December to end of April

Historical Ice Jam Map



Historical Ice Jam Map

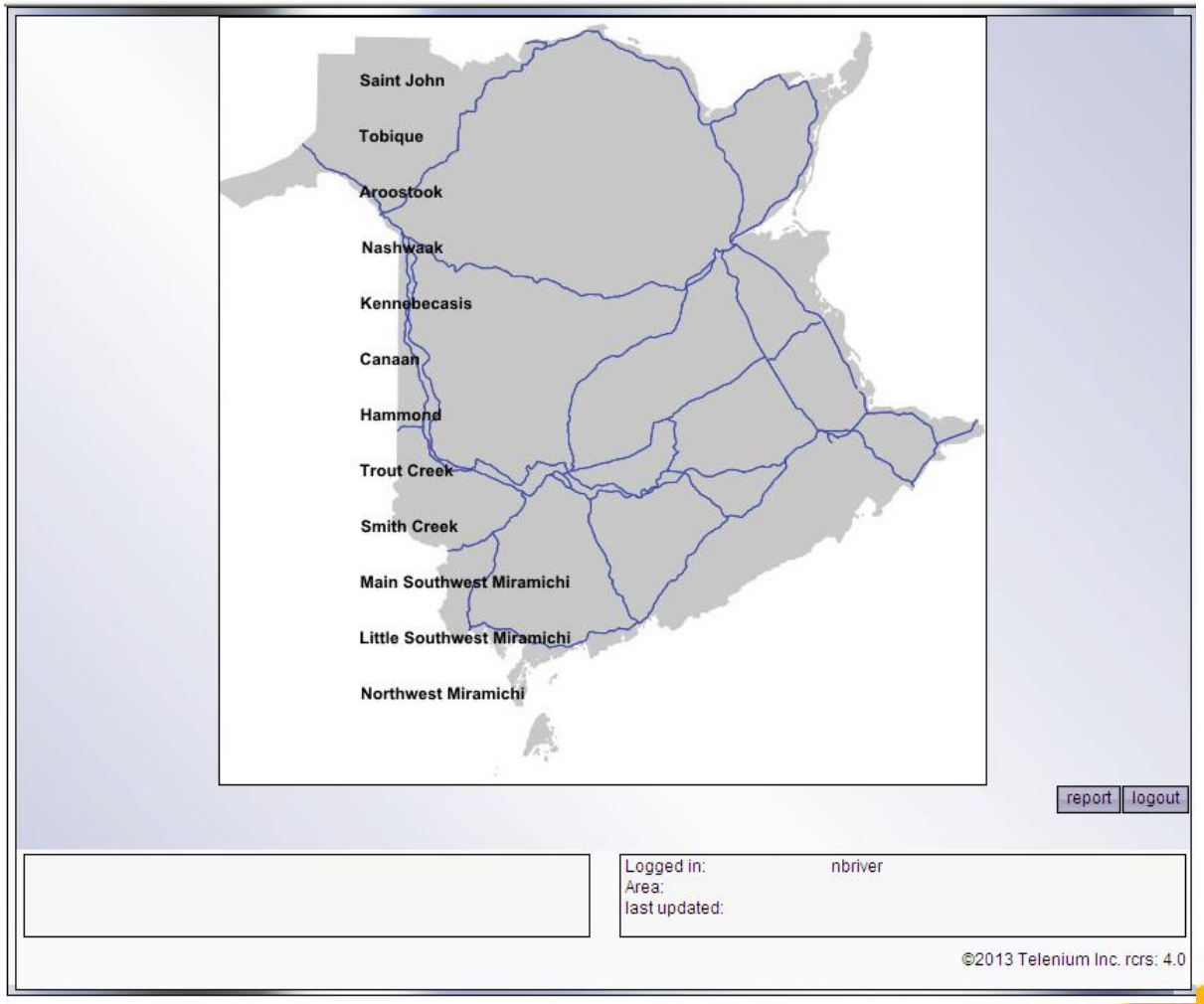


Importance of Historical Ice Records

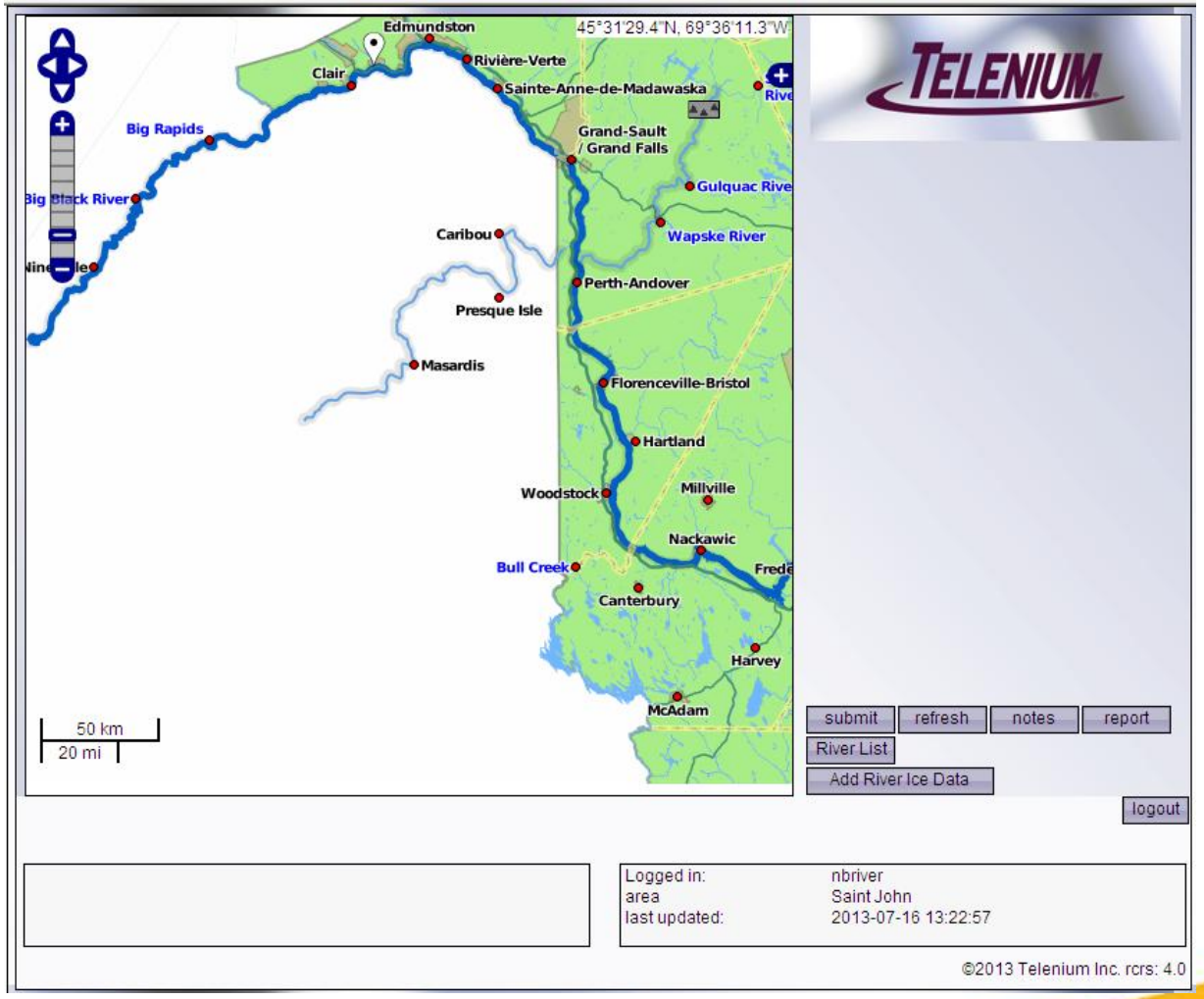
- Awareness of locations of past severe ice jams and flooding
- Monitoring for changes in river ice phenology
- Past ice condition and jam data is important to aid in calibration of Ice Jam Model
- March 2012, an extreme temperature event led to ice in the Upper SJR running and jamming in the middle of the basin causing flooding to record levels the community of Perth-Andover.


Perth Ice Jam 2012
Photo taken by: Dave Purdy – NB Power

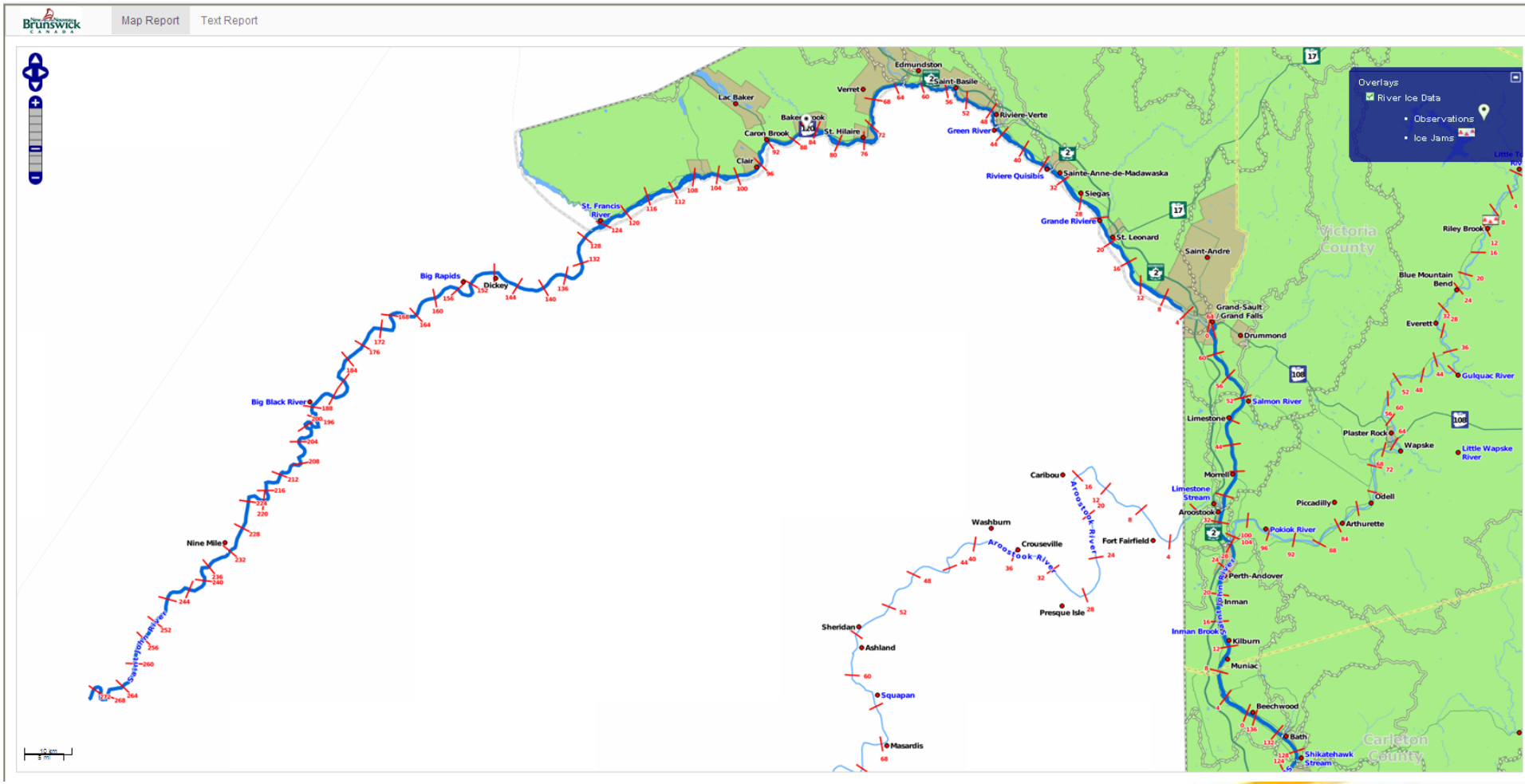
River Ice Application and Database



River Ice Application and Database



River Ice Application and Database



River Ice Application and Database

New Nouveau Brunswick

Add River Ice Data

created: 2013-09-04 09:39:29 last modified: 2013-09-04 09:39:29 tracking#: 92013090409392930
created by: nbriver last modified by: nbriver

Type: Observation
River: Saint John Reach: Mactaquac to Beechwood
Reach From: 137 km of reach 137 46.5409, -67.6661 Beechwood Dam
Reach To: 0 km of reach 0 45.955, -66.8716 Mactaquac Dam

Start date:
Start time:
End date:
End time:

Report Type:

Freeze up

Border Ice:

feet out from left bank
feet out from right bank
% of channel open

Moving Ice:

- frazil slush
- frazil pans
- fragmented sheet ice
- large sheets

% channel with moving ice

Fully Ice Covered:

Intact ice cover

- evidence of decay
- melting snow
- melting ice
- candled ice
- grey ice
- black ice
- fracturing along bank
- fractured ice surface
- open cracks
- open lead

ice roughness
ice thickness at fracture
distance to shore

Break up

Lead Opening:

feet out from left bank
feet out from right bank
% of channel open

Ice Description:

- slush
- fragmented block
- large sheets
- mixture

River Channel:

- water on ice (pooled)
- water on ice (flowing)
- ice is moving
- clear of ice

Cracks/Ridges:

- parallel to shore
- perpendicular to shore
- cracks/ridges

distance between cracks
height of ridge
Shear wall height:

Additional Information:

Weather Observations:

temperature
temperature type
wind speed
wind direction

« 18/ 18

save & new | save | back | archive

Logged in: nbriver
area Saint John
last updated: 2013-07-16 13:22:57

d River Ice Data created: 2013-09-04 09:39:29 last modified: 2013-09-04 09:39:29 tracking#: 92013090409392930
created by: nbriver last modified by: nbriver

pe: Ice Jam
ver: Saint John Reach: Mactaquac to Beechwood
ach
om: 137 km of reach 137 46.5409, -67.6661 Beechwood Dam
ach
0 km of reach 0 45.955, -66.8716 Mactaquac Dam

Start date:
Start time:
End date:
End time:

Jam Types:
- Freeze up
- Break up

Jam Status:

Jam Initiator:
- solid ice sheet
- bend in river
- bridge in river
- island
- constriction
- reduction in water slope
- other

Physical Description:
- water elevation downstream
- water elevation upstream
- difference between up/down elevation
- cubic feet of water accumulated behind jam
- flow velocity (meters/sec)
- jam roughness
- height of shear wall
- risk index number
- risk probability
- lead opening in jam width length

Composition:
- slush
- fragmented blocks
- large sheet
- mixture
- slush/ice entering under jam
- backwater
- water bypassing jam
- slush/ice accumulating at head of jam
- ice surface buckled or mounded
- candled ice
- competent ice

ditional Information:

Weather Observations:
- temperature:
- temperature type
- wind speed:
- wind direction:

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save & new | save | back | archive

Logged in: nbriver
area Saint John
last updated: 2013-07-16 13:22:57

River Ice Application Reporting

print close save

highway advisories: Saint John 2013-09-04 9:42:04 AM

Base Name	advisory	last update
Saint John	dasfadsfadsfadsfadf	2013-06-26 15:19:58

Observation/Ice Jams Report: Saint John 2013-09-04 9:42:04 AM

River	Reach Start	Reach End	Observation/Jam Reports	Last Update - Reported By
Saint John	KM 172 (47.0435,-69.3176)	KM 0 (47.0514,-67.7411) Grand Falls Dam	intact ice cover - melting snow, starting 2013-06-26 13:19, estimated cracks distance 1 feet from right bank looking down river, height of ridge: 2 feet, shear wall height of 3 feet	2013-06-26 15:19:58 tels0001nr
Tobique	KM 20	KM 0 (47.2452,-67.1559)	freeze up, bend in river, island, reduction in water slope, jam formation, slush, fragmented blocks, backwater, starting 2013-06-04 04:00 to 2013-06-28 22:00, water elevation downstream is NaN feet, flow velocity is NaN meters/sec, height of shear wall is NaN feet, Observed weather: 22 C wind N light . Test Test Test	2013-06-17 17:54:39 tels0001nr
Nashwaak	KM 1 (45.9569,-66.6126)	KM 0 (45.9552,-66.6244) Nashwaak River	break up, jam stopped, bend in river, island, reduction in water slope, slush, large sheet, backwater, water bypassing the jam, starting 2013-06-13 06:20 to 2013-06-28 07:50, water elevation downstream is NaN feet, water elevation upstream is NaN feet, water elevation difference is NaN feet,NaN cubic feet of water accumulated behind jam, flow velocity is NaN meters/sec, jam roughness is estimated at NaN feet, height of shear wall is NaN feet, risk index NaN, risk probability NaN, lead opening in jam is NaN feet in width NaN feet in length, Observed weather: 23 C wind S moderate . Test Test Test e	2013-06-17 18:01:45 tels0001nr
Nashwaak	KM 16 (46.058,-66.5929)	KM 15 (46.0503,-66.5975)	break up, jam stopped, bend in river, fragmented blocks, slush/ice entering the jam, starting 2013-07-16 11:00 to 2013-07-16 12:30, . test on a 30 degree day in July	2013-07-16 13:22:56 nbriver
Kennebecasis	KM 0 (45.4929,-65.9209) Perry Point	KM 70 (45.7782,-65.3829) Penobsquis	freeze up, solid ice sheet, jam consolidation, slush, fragmented blocks, large sheet, mixture, slush/ice entering the jam, backwater, water bypassing the jam, starting 2013-06-15 11:00 to 2013-06-28 16:44, Observed weather: 40 C wind SE strong . Test test test	2013-06-14 15:51:40 tels0001nr
Kennebecasis	KM 1	KM 0	solid ice sheet, bend in river, bridge in river, island, constriction, reduction in water slope, jam consolidation, slush, fragmented blocks, large sheet, mixture, slush/ice entering the jam, backwater, starting 2013-06-03 01:00 to 2013-06-28 14:00, water elevation downstream is 88888 feet, water elevation upstream is 8888 feet, water elevation difference is 8888 feet,8888 cubic feet of water accumulated behind jam, flow velocity is 8888 meters/sec, jam roughness is estimated at 8888 feet, height of shear wall is 8888 feet, risk index 8888, risk probability 8888, Observed weather: 5 C wind N calm	2013-06-17 18:08:52 tels0001nr
		KM 0 (45.83 -		

New Nouveau Brunswick

River Ice Application Reporting

Ice Jam on Kennebecasis River — **Tracking ID: 2013061415494900**

Reach: Perry Point To Penobsquis

From KM 0 (Perry Point) To KM 70 (Penobsquis)

Freeze Up

Jam Status
- Jam Consolidation, Slush/Ice Entering Underjam, Water Bypassing The Jam, Slush/Ice Accumulating At Head Of Jam

Jam Initiator
- Solid Ice Sheet
- Slush
- Fragmented Blocks
- Large Sheet
- Mixture
- Backwater
- Ice Surface Buckled Or Mounded
- Candled Ice
- Competent Ice

Weather Observations

Temperature:	40.0 °C
Wind:	Strong SE

Additional Information

Test test test

Start Date

Saturday, 15 June 2013 11:00:00 AM ADT

End Date

Friday, 28 June 2013 04:44:00 PM ADT

Created On

Friday, 14 June 2013 03:49:49 PM ADT By **tels0001nr**

Last Modified On

Friday, 14 June 2013 03:51:40 PM ADT By **tels0001nr**

Saint John River

Observation on Saint John River — **Tracking ID: 2013062615195800**

Reach: Grand Falls To Nine Mile

From KM 172 ( ) To KM 0 (Grand Falls Dam)

Details
- Intact Ice Cover - Melting Snow

Distance Between Cracks:	1.0 ft
Height of Ridge:	2.0 ft
Shear Wall Height:	3.0 ft

Start Date

Wednesday, 26 June 2013 01:19:00 PM ADT

Created On

Wednesday, 26 June 2013 03:19:58 PM ADT By **tels0001nr**

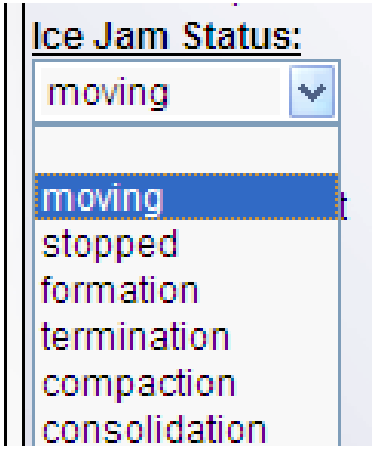
Last Modified On

Wednesday, 26 June 2013 03:19:58 PM ADT By **tels0001nr**

New Nouveau Brunswick

River Ice Application Reporting

- Alerting notifications will be sent by email, or phone call when an **Ice Jam Status** is moving, stopped, formation, termination, compaction, consolidation; or there is a change to a previous reported status.



River Ice Application and Database

Next:

- Hardware Integration of a GPS to assist observer in identifying their location
- Field data temporary storage when outside of cellphone coverage.

Laptop GPS Receiver

Questions?

Marysville Dam
Dec 2010